FOREST PEST CONDITIONS IN CALIFORNIA-1980

PUBLICATION OF
CALIFORNIA FOREST PEST CONTROL ACTION COUNCIL

THE CALIFORNIA FOREST PEST CONTROL ACTION COUNCIL was founded in 1951. Its membership is open to public and private forest managers, foresters, silviculturists, entomologists, pathologists, zoologists, and others interested in the protection of forests from damage caused by animals, insects, and diseases. Its objective is to establish, maintain, and improve communication among individuals -- managers, administrators, and researchers -- who are concerned with these problems. This objective is accomplished by four actions:

1. Coordination of detection reporting and compilation of pest damage information.

2. Evaluation of pest conditions.

3. Pest control recommendations made to forest managing agencies and owners.

4. Review of policy, legal, and research aspects of forest pest control, and submission of recommendations thereon to appropriate authorities.

The State Board of Forestry recognizes the Council as an advisory body in forest pest protection. The Council is a participating member in the Western Forest Pest Committee of the Western Forestry and Conservation Association.

This report, **FOREST PEST CONDITIONS IN CALIFORNIA - 1980,** is compiled for public and private forest land managers to keep them informed of pest conditions on forested land in California, and as an historical record of pest trends and occurrences. The report is based largely on information provided by the Statewide Cooperative Forest Pest Detection Survey; in 1980, 171 reports were received: 61 for insect pests, 76 for diseases, and 34 for animal pests.

The report was prepared by the Forest Service in cooperation with other member organizations of the Council. It was duplicated and distributed by the California Department of Forestry.

THE COVER PHOTO: Mature larvae of the pandora moth on Jeffrey pine, Lookout Mountain, Mono County. (Photo by T.W. Koerber.)

Sacramento January 1981

HIGHLIGHTS OF PEST CONDITIONS - 1980

STATUS OF INSECT PESTS. Jeffrey pine beetle infestations that built up over the past two years were the severest in recent history for some areas, particularly Lassen Volcanic National Park and adjacent lands to the north. Levels of western pine beetle, mountain pine beetle, and pine engravers were greatly reduced from those of recent years and only localized pockets of tree mortality were found. Red turpentine beetle remained common, but tree mortality from attacks was infrequent.

With the exception of the pandora moth, fruittree leafroller, and the lodgepole needleminer, defoliator activity was minimal in 1980. No significant activity was reported for the Douglas-fir tussock moth, sawfly, Jeffrey pine needleminer, or tent caterpillar.

Grasshoppers caused serious losses in a few plantations, and population levels will be monitored in 1981. The gouty pitch midge, pine needle sheathminer, and Douglas-fir reproduction weevil caused problems in some plantations in northern California.

STATUS OF DISEASES. Root diseases and dwarf mistletoes were the major disease problems confronting forest and recreational land managers. More than one-half of the requests for assistance involved Fomes annosus. New reports of black stain root disease on Douglas-fir caused concern. Wet, protracted spring weather contributed to an increase of reports of needle and foliage diseases.

Fusarium oxysporum was the major nursery problem. A Phytophthora sp. was associated with graft failure of superior ponderosa pine stock, and Sirococcus tip blight was reported at Humboldt and Magalia nurseries.

Three previously unreported diseases were recorded in the State in 1980. Phytophthora root rot of Port-Orford-cedar was found at seven locations in the Smith River drainage system and on ornamental cedars in the city of Eureka. Laminated root rot of Douglas-fir was reported in Humboldt County. The pinewood nematode was reported from Monterey and Siskiyou Counties.

STATUS OF ANIMAL PESTS. Deer, pocket gopher, and porcupine caused widespread damage to commercial conifer forests. Black bear damage increased in the North Coast region.

STATUS AND CONTROL OF INSECTS

PANDORA MOTH, Coloradia pandora. The 1979 outbreak of pandora moth on Jeffrey pine in the vicinity of Lookout Mountain, Mono County, showed evidence of persisting into 1981. An evaluation completed in November, 1980 delineated the infested area, described the possible direct and indirect effects of continued defoliation, related the influence of environmental factors on the population, and presented management alternatives. Information gathered indicated that the area of infestation increased, that high population levels persisted in the area severely defoliated in 1979, and that equally high populations were present in some areas previously defoliated only lightly.

FRUITTREE LEAFROLLER, Archips argyrospilus. The fruittree leafroller infestation, first reported in 1974, grew from 12,000 to about 25,000 acres. Most of the damage occurred on California black oak and other ornamental hardwoods in the Lake Arrowhead and Forest Falls areas of San Bernardino County. The infestation in the Lake Gregory area expanded into an area from Twin Peaks to Sugarpine Mountain. Moderate to heavy defoliation also occurred at Fern, Shake, and Cedar Creeks north of Heaps Peak. Light defoliation was reported for the first time from Camp Angelus. A small experimental ground spraying of individual trees with Bacillus thuringiensis reduced damage about 60%.

GYPSY MOTH, Porthetria dispar. During the spring, several viable egg masses and live gypsy moth larvae were found in moving van shipments. They occurred on various items including dog houses (Orange County, Stanislaus County - 3 live adult females, 3 live adult males), outdoor furniture (San Diego and Santa Clara Counties), a wheelbarrow and playhouse (Monterey County) and inside a wine barrel (Contra Costa County). A total of six adult males were caught in pheromone detection traps in 1980. Two moths were trapped in Orange County and one each in Los Angeles, Santa Barbara, Santa Cruz, and Santa Clara Counties.

LODGEPOLE PINE NEEDLEMINER, Coleotechnites milleri. Populations were high but stable over many of the 100,000 infested acres in the Merced and Tuolumne River drainages of Yosemite National Park. Several areas had been defoliated for 4-6 years and considerable tree mortality occurred over 10,000-15,000 acres. Populations in a few heavily defoliated areas declined primarily because of a paucity of needles in which to live. Increasing populations were noted in the higher elevation areas which were about one generation behind the other areas. Some extension of the infested area occurred eastward to Dana Meadows. A separate infestation caused some mortality over several thousand acres in the back country of Sequoia National Park.

ELM LEAF BEETLE, Pyrrhalta luteola. Elm leaf beetle activity was reported over 75 acres in the Wildwood Picnic Area on the Angeles National Forest (Los Angeles County). Several elms in the area suffered complete defoliation in 1979 and 1980.

JEFFREY PINE BEETLE, Dendroctonus jeffreyi. Infestation levels were high in Lassen Volcanic National Park and in Lassen National Forest along the northern border of the Park. Young Jeffrey pine stands were reported to have suffered particularly alarming losses, with group mortality even in lightly thinned stands. Serious tree mortality also continued in areas of the Tahoe Basin where recreational values may eventually be impaired. Other infestations of Jeffrey pine beetles were reported in eastern El Dorado County and Alpine County; at Willard Creek, Lassen County; and Hunters Ridge, Modoc County.

WESTERN PINE BEETLE, Dendroctonus brevicomis. Western pine beetle infestations receded from the excessively high levels of the past few years in the Sierra Nevada. However, beyond the northern end of these mountains, western pine beetle depredations continued on Walker Forest property and on the Eagle Lake District north of Susanville, Lassen County. Activity was also noted north of Burney, Shasta County; McCloud Flats, Siskiyou County; Figueroa Mountain, Santa Barbara County; and around the Marble-Cone Burn in Monterey County.

RED TURPENTINE BEETLE, Dendroctonus valens. Attacks upon pine trees by the red turpentine beetle were unusually common in Yosemite Valley and throughout the western slope of the Sierra Nevada. In most cases the infested trees were not killed. Increasing attacks were noted in Lake County. In Lassen County the beetle was reported in its usual association with the western pine beetle and mountain pine beetle. It also was reported along with the western pine beetle at McCloud Flats, Siskiyou County.

FIR ENGRAVER, Scolytus ventralis. With some exceptions, declining infestations were apparent for fir engravers in 1980. This beetle caused above-normal mortality in pole-sized fir in the eastern portions of the Tahoe and Plumas National Forests and in central Modoc County; it was probably responsible for top-killing reported from Sequoia-Kings Canyon National Parks. Fir engravers and the round-headed fir borer, Tetropium abietis, were identified in killing white fir in areas of high tree mortality northwest of Susanville, Lassen County.

MOUNTAIN PINE BEETLE, Dendroctonus ponderosae. Only a few areas of significant infestation by the mountain pine beetle were reported in 1980. Several groups of lodgepole pine mortality were noticed in the Tahoe Basin. Changes in sub-surface water tables were suspected as a contributing factor.

Elsewhere, overmature ponderosa pines were killed in Lassen County; about 100 sugar pine died over a large area in the vicinity of Dog Creek Mountain, Shasta County; and a number of western white pines were killed near Willow Creek Mountain, Siskiyou County.

PINE ENGRAVER BEETLES, Ips spp. The very low levels of Ips activity reflected generally improved soil moisture conditions. Some pockets of damage were noted in the central Sierra Nevada and in eastern

Mendocino and Lake Counties. In southern California, Ips pini was active in the tops of mature pines in the area of Wrightwood-Big Pines, San Bernardino County.

FIR FLATHEADED BORER, Melanophila drummondi. Extensive mortality of residual Douglas-fir attributed to the fir flatheaded borer continued in cutover areas in Sonoma, Humboldt, and Del Norte Counties. In a few cases tree mortality also occurred in adjacent uncut, old growth stands. Several ornamental Douglas-fir also were infested and killed in the town of Happy Camp, Siskiyou County.

REPRODUCTION INSECTS. Grasshoppers seriously damaged 440 acres of pine plantation on the Shasta-Trinity National Forest, Siskiyou County. Another 2,000 acres supported populations causing moderate damage. Twenty to thirty acres of pine seedlings planted within the Granite Burn on the Stanislaus National Forest, Tuolumne County, were seriously damaged by Melanoplus devastator. An experimental area on the Goosenest Ranger District, Klamath National Forest, Siskiyou County, was treated with malathion to prevent further damage to seedlings. Populations in these areas will be monitored in 1981 to ascertain the necessity of suppression treatments to be conducted by the Animal and Plant Health Inspection Service (APHIS).

The gouty pitch midge, Cecidomyia piniinopis, continued to retard growth of ponderosa pine plantations in the Shasta Brush Fields, Siskiyou County, and was serious in plantations on the Goosenest Ranger District, Siskiyou County. The pine needle sheathminer, Zelleria haimbachi, and the pine reproduction weevil, Cylindrocopturus eatoni, contributed to growth loss in these areas.

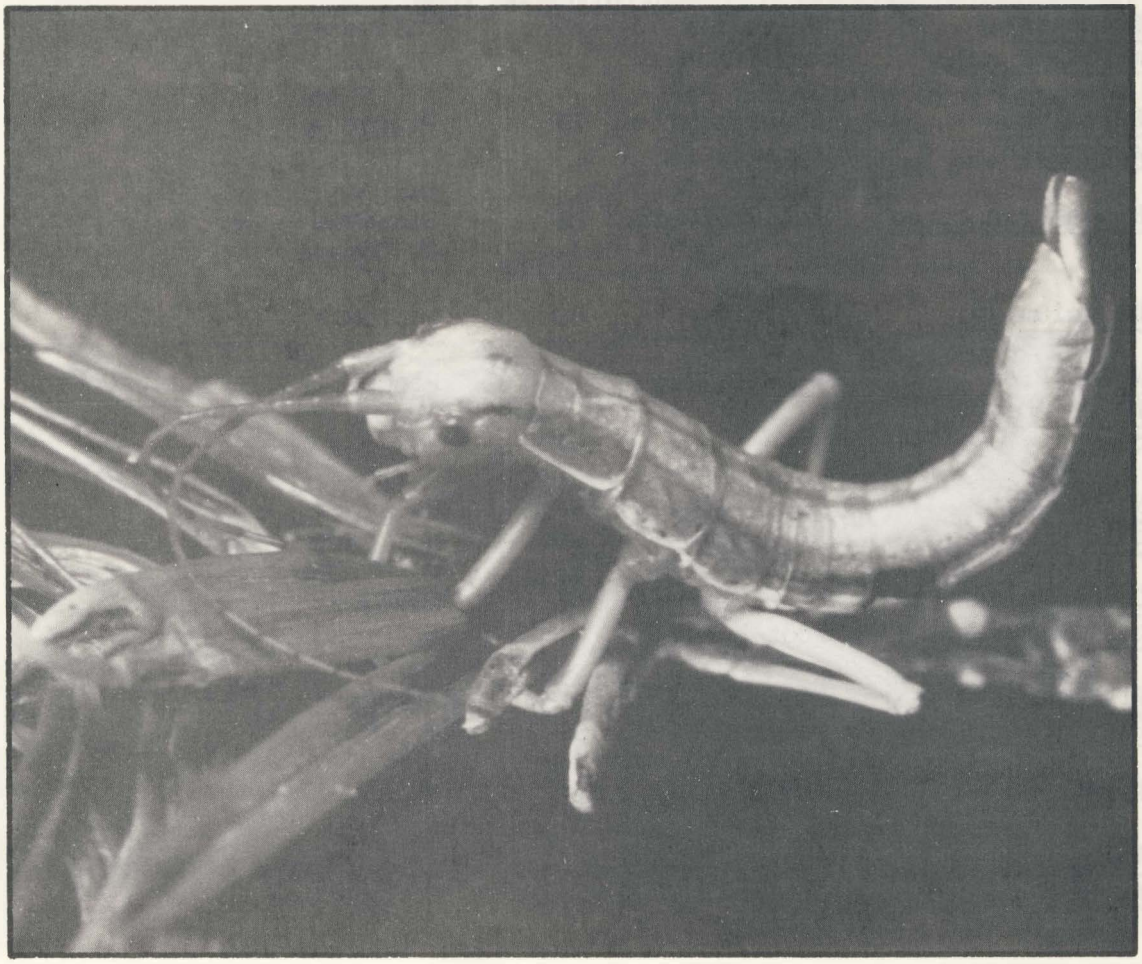
Some replanting was necessary in two plantations on the Mad River Ranger District, Six Rivers National Forest (Trinity County), because of seedling mortality caused by the Douglas-fir reproduction weevil, Cylindrocopturus furnissi. The plantations will be released from competition to reduce the effects of damage.

The ponderosa pine tip moth, Rhyacionia zozana, continued to cause minor damage in progeny test areas. More significantly, the western pine shoot borer, Eucosma sonomana, caused a surprising amount of growth loss in certain plantations near McCloud and Mt. Shasta City, Siskiyou County.

CONE AND SEED INSECTS. Cone crops generally were good in the Sierra Nevada and, although many of the cones of the various tree species were infested, seed losses were not serious enough to hinder collections. Yields of seed per cone were better than in 1979. Collections of Douglas-fir throughout the interior range of the species were not as heavily infested as in 1979, and Badger Hill Tree Breeding Arboretum (El Dorado County) did not incur the serious losses found in past years. However, the cone moth, Barbara colfaxiana, and the cone midge, Contarinia orgonensis, continued to cause serious losses at many locations in Del Norte, Humboldt, and Siskiyou Counties. Treatment of superior Douglas-fir by injection of Metasystox-R resulted in

increased seed yields and permitted the North Zone Tree Improvement Program to collect badly-needed seed from some of these areas in Siskiyou County.

WALKINGSTICK (unidentified). The first California record of conifer defoliation by a walkingstick (Phasmidae) was reported from Mendocino County. Forty acres of unmanaged, dense overstory and understory on the Willits Watershed was affected. The insects preferred the older foliage of Douglas-fir and ponderosa pine, and some feeding also was detected on madrone. Intermediate and suppressed Douglas-fir located in the interior of the stand were the most severely defoliated. Mortality may occur in the severely defoliated understory. Merchantable overstory trees were hardly affected. The infestation gave the stand the general appearance of a sawfly outbreak.



WALKINGSTICK. This insect was collected from understory Douglas-fir on the Willits watershed, Mendocino County.

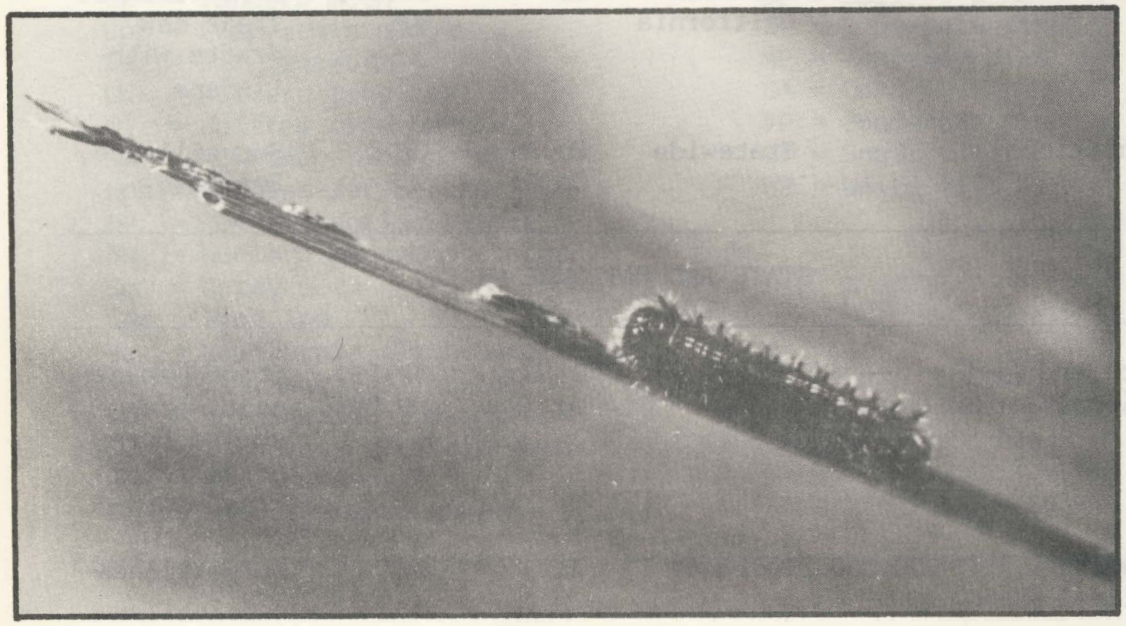
TABLE I. INSECTS OF LIMITED IMPORTANCE IN CALIFORNIA FORESTS - 1980

PESTS		HOSTS	WHERE EXAMINED OR REPORTED	
Scientific Name	Common Name	Names	County	Remarks
Adelges cooleyi	Cooley spruce gall aphid	DF	Trinity	
Chrysomela crotchi	Aspen leaf beetle	QA	Tulare	
Cinara sp.	Giant conifer aphids	WF	Calaveras, Humboldt	
Elatobium albietinum	Spruce aphid	SS	Humboldt, Del Norte, Mendocino	
Epinotia meritana	White fir needleminer	WF	Calaveras	
Halisidota argentata	Silverspotted tiger moth	DF	Plumas	
Hyphantria cunea	Fall Webworm	MA	Siskiyou El Dorado	
Lecanium sp.	Scale	BO	Tuolumne	
Neodiprion fulviceps complex	Pine Sawfly	PP	Placer	Forest Hill Test Plantation
Nuculaspis californica	Black pine-leaf scale	WF	Calaveras	
Otiorhynchus ovatus	Strawberry root weevil	DF	Humboldt	Humboldt Nursery
Pityogenes sp. Pityophthorus sp.	Twig beetles	PP,JP, SP	Plumas	
Psychidae	Bagworm	DF	Plumas	
Rhabdophaga salicis	Basket willow gall maker	WI	Siskiyou	

PESTS		HOSTS	WHERE EXAMINED OR REPORTED	
Scientific Name	Common Name	Names	County	Remarks
Malacosoma sp.	Tent caterpillar	OA	Mendocino	Some trees severe defoliation
Thricolepis inornata		WF	Eldorado	Damaged buds on Xmas trees
	Tree hoppers, Soft scales	BO	Calaveras	
Trisetacus alborum	Bud mite	SP	Tulare	Large SP

HOST ABBREVIATIONS

BO	Black oak	QA	Aspen
DF	Douglas-fir	SP	Sugar pine
JP	Jeffrey pine	SS	Sitka spruce
OA	Oak	WI	Willow
PP	Ponderosa pine	WF	White fir
MA	Madrone		



PANDORA MOTH. Larva of Coloradia pandora from Deadman Campground, Inyo National Forest, Mono County.

TABLE II. INSECT CONTROL ACTIONS RECOMMENDED - 1980

INFESTATION AREA	ACREAGE (Est.)	COUNTY	INSECT	HOST	RECOMMENDED ACTION
NORTHERN CALIFORNIA COMMERCIAL AND RECREATIONAL FORESTS					
BARK BEETLES:					
Northern California	--	--	Db,Dj, Dp,Dps, Mc,Ips, Md,Sv	CF	Stand Management, Slash Disposal
DEFOLIATORS:					
Statewide	--	--	Gm	OA	Surveillance
Statewide	--	--	Op	WF	Surveillance
Lookout Mtn.	10,000	Mono	Cp	JP	Surveillance, Evaluate
PLANTATIONS AND SEED ORCHARDS					
Seed Orchards	100	Northern California	Da	PP,DF, SP	Surveillance, Treat new grafts with Lindane
Plantations	--	Statewide	Eu,Zh, Cp,Rz	CF	Surveillance, Evaluate
STATE AND NATIONAL PARKS					
State and National Parks	--	--	Dj,Db, Dp	JP,PP, SP,LP	Stand management, Prescribe burn, Borax stump treatment
Yosemite National Park	100,000	Tuolumne	Cm	LP	Surveillance

INFESTATION AREA	ACREAGE (Est.)	COUNTY	INSECT	HOST	RECOMMENDED ACTION
		SOUTHERN CALIFORNIA RECREATIONAL FORESTS			
Southern California	--	San Bernardino	Dp,Db, Dj,Ips	PP,CP, JP,SP	Stand Management, Borax stump treatment
		Los Angeles, Riverside, Ventura, Santa Barbara	Mc,Dv, Sv	PP,CP, JP,SP, WF	Stand Management, Borax stump treatment
Lake Gregory, Lake Arrowhead, San Gorgonio	14,000	San Bernardino	Aa	OA	Surveillance, Evaluate

PEST ABBREVIATIONS

Aa = Fruittree leafroller
Cj = Jeffrey pine needle miner
Cm = Lodgepole needleminer
Cp = Pandora moth
Cpp = Pine resin midge
Da = Fir coneworm
Db = Western pine beetle
Dj = Jeffrey pine beetle
Dp = Mountain pine beetle
Dps = Douglas-fir beetle
Dv = Red turpentine beetle
Eu = Western pineshoot borer
Gm = Gypsy moth
Ips = Pine ips
Mc = California flatheaded borer
Md = Flatheaded fir borer
Op = Douglas-fir tussock moth
Rz = Ponderosa pine tip moth
Sv = Fir engraver
Zh = Needle sheath miner

HOST ABBREVIATIONS

CF = Conifers
CP = Coulter pine
DF = Douglas-fir
JP = Jeffrey pine
LP = Lodgepole pine
MP = Monterey pine
OA = Oak
PP = Ponderosa pine
SP = Sugar pine
WF = White fir

STATUS AND CONTROL OF DISEASES

ABIOTIC. Continued recovery of trees from the 1975-1977 drought decreased the number of weather-related damage reports. June frost damage was reported on the new growth of oaks in the Hat Creek Valley, Lassen County, and vicinity. Reports of salt damage along major highways increased in the Lake Tahoe Basin.

WHITE PINE BLISTER RUST. Although white pine blister rust (Cronartium ribicola) has been present on the North Coast and in the northern Sierra Nevada for more than fifty years, new centers of infection were still being discovered in 1980. On the Mendocino National Forest, new infections were found in Lake County and on several hundred acres of sugar pine saplings in Glenn County. In the southern Sierra, spread and intensification was noted at Dinkey Creek on the Sierra National Forest (Fresno County), at Mountain Home State Forest (Tulare County), and at Black Mountain Grove and elsewhere on the Sequoia National Forest (Fresno, Tulare, and Kern Counties).

The race of blister rust infecting formerly-resistant pines at the Forest Service test site at Happy Camp (Siskiyou County) initiated few new infections in 1980.

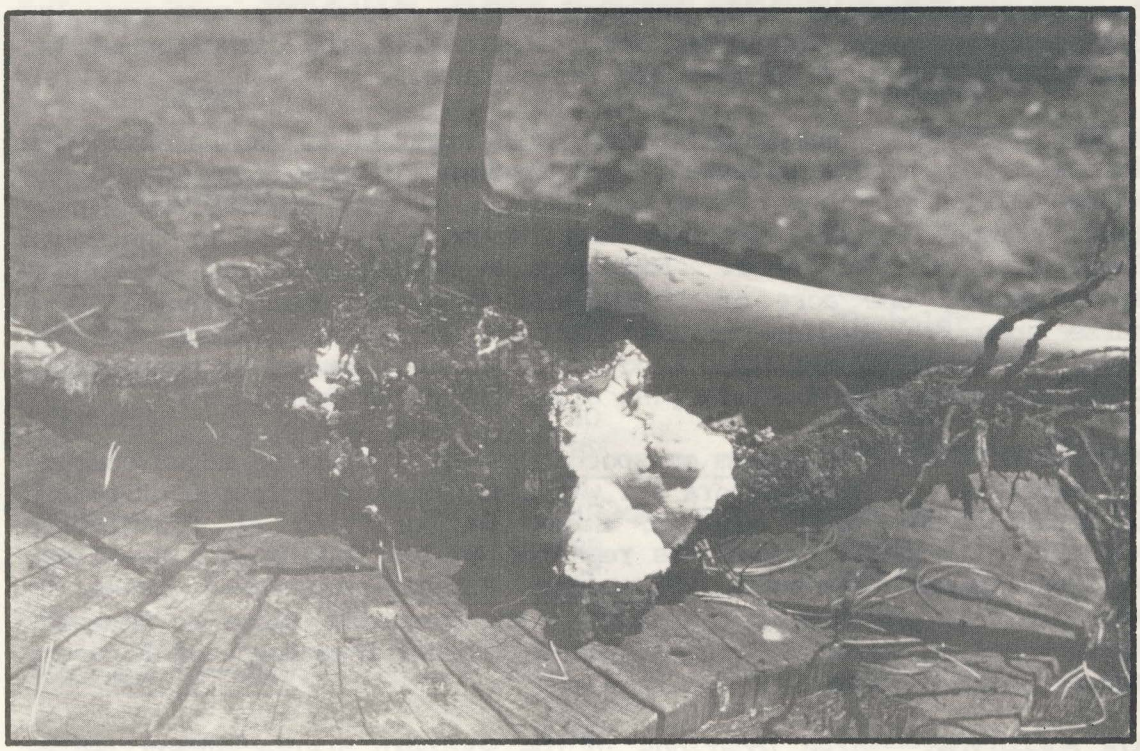
ROOT DISEASES. More than one-half of the requests for evaluations involved damage from Fomes annosus; many of these were for a benefit-cost analysis of borax stump treatment. Annosus root disease continued to concern managers of recreation sites in the San Bernardino, Cleveland, and Los Padres National Forests. More areas affected by the disease were discovered on the Mendocino National Forest as silviculturists become aware of the problem.

Reports of black stain root disease caused by Ceratocystis wageneri increased as a result of a survey to better define the distribution of the disease within the State.

Phytophthora root rot of Port-Orford-cedar, caused by Phytophthora lateralis, was found at seven sites in Del Norte County and on ornamental cedars at one site in the city of Eureka, Humboldt County. The disease was not found in any other Port-Orford-cedar stands surveyed in northern California.

Laminated root rot, caused by Phellinus weirii, was confirmed from one Douglas-fir tree along Redwood Creek in Humboldt County. Although the disease is considered the major problem of Douglas-fir in the Pacific Northwest, this is the first known report of the disease in California forests.

DUTCH ELM DISEASE. Dutch elm disease, caused by Ceratocystis ulmi, did not spread into any additional counties in 1980, and the number of affected Bay Area counties remained at eight. Since the disease was first discovered in California in 1975, 266 infected sites have been found. Eighty-two percent of the sites found prior to the end of 1977



ANNOSUS ROOT DISEASE. The presence of fruiting bodies, or conks, of Fomes annosus is the best evidence of the root disease in the field. The conks are usually found below the litter layer at the base of infected trees or in stump cavities. They vary in shape and size, and have a light brown to gray upper surface and a creamy white lower pore surface.

WHITE PINE BLISTER RUST. Infection of the main bole of sugar pine by the fungus, Cronartium ribicola.

have remained free of newly infected trees. During the past year 193 diseased elms were identified and removed under the direction of the California Department of Food and Agriculture.

NEEDLE DISEASES. Above-normal rainfall contributed to an increased incidence of needle diseases. Elytroderma disease was common and widespread on portions of the Six Rivers, Lassen, Plumas, and Cleveland National Forests, and may have become more severe in the South Shore area of Lake Tahoe. Lophodermium needle cast was severe on approximately one acre of 18-year-old ponderosa pine planted as a nurse crop for Douglas-fir reproduction on a wet site on the Six Rivers National Forest. Red band needle blight, caused by Dothistroma pini, was common on Monterey pine along the north Coast.

NURSERY DISEASES. Fusarium oxysporum was the disease of major concern in nurseries. A Phytophthora sp. was associated with losses of potted ponderosa pines used as root stock for grafting at Placerville Nursery. Phomopsis canker was reported on 1-0 Douglas-fir seedlings at the Humboldt Nursery. Sirococcus strobilinus caused losses in approximately one acre of 1-0 Jeffrey and ponderosa pines at Humboldt Nursery and on ponderosa pine at the California Department of Forestry nursery near Magalia.

AIR POLLUTION. Three locations in the southern Sierra Nevada (Whitaker Forest, Mountain Home State Forest, and Greenhorn Summit) were monitored for ozone during 1980. In general, ozone levels were similar to those recorded in 1978 and 1979, with peak values in the range of 10-14 parts per hundred million.

Ten-tree plots at twenty-seven ground locations scattered throughout the Sierra and Sequoia National Forests were evaluated for any change in ozone injury to pine foliage between 1977 and 1980. Fourteen of these plots showed increased injury, seven showed decreased injury, and six were unchanged from 1977 levels. Even though measured ozone levels in 1980 were not above those in previous years, injury symptoms on pines intensified in specific locations.

PINEWOOD NEMATODE. The pinewood nematode (Bursaphelenchus lignicolus), the causal agent of a pine wilt disease in Japan, was recovered from dead ponderosa, shore, and Monterey pines in Siskiyou County. The nematode was also found in Monterey County. It has not been found in California forests, although several species of ornamental pines are reportedly susceptible to the wilt. The nematode has been recovered from numerous species of pines in most eastern states, but California is the only state west of the Rocky Mountains where it has been reported. The potential for nematode-caused damage to pine forests in the United States is presently unknown.

TABLE III. FOREST DISEASES REPORTED - 1980

AGENT	HOST	COUNTY
ABIOTIC DISEASES:		
Chemical	DF	Del Norte
	MR	Monterey
	PP	Humboldt
	SP	Calaveras
Weather	BO	Shasta
	PP	San Diego
Unknown	MP,MR	San Francisco
	PP	Butte
	WF	San Bernardino
FOLIAGE DISEASES:		
Dothistroma pini	MR	Mendocino
Elytroderma deformans	PP	Plumas
	PP	Shasta
	JP	Lassen (2)
Herpotrichia nigra	RF	Shasta
Lophodermium pinastri	MR	Humboldt
	PP	Del Norte
Naemacyclus niveus	MR	Humboldt
Rhabdocline pseudotsugae	DF	Del Norte
DECAYS:		
Fomes pini	DF	El Dorado
Fomes pinicola	WF	Siskiyou
Ganoderma applanatum	RW	San Francisco
NURSERY DISEASES:		
Botrytis cinerea	DF	Mendocino
	DF	Sonoma
	RW	Humboldt

AGENT	HOST	COUNTY
Fusarium oxysporum	PP,SP,WF	Santa Cruz
	PP,SP,RF,WF,GS	Butte
Phomopsis lokoyae	DF	Humboldt
Phytophthora sp.	PP	El Dorado
	WF	Santa Cruz
Pythium sp.	WF	Santa Cruz
Pestalotia sp.	RW	Del Norte
Rhizoctonia sp.	RW	Del Norte
Sirococcus strobilinus	JP,PP	Humboldt
	PP	Butte
CANKERS:		
Cytospora abietis	RF	Shasta
PARASITIC SEED PLANTS:		
Arceuthobium spp.	DP	Tulare
	JP	Lassen
	PP	Amador
Phoradendron spp.	BL,LO	Tulare
ROOT DISEASES:		
Armillariella mellea	DF	Sonoma
	IC	Napa
Fomes annosus	DF,PP	Siskiyou
	JP	Mono
	PP	Siskiyou
	RW	Mendocino
	RW	Shasta
	SP	Tulare
	JP	Lassen (2)
	PP	Lassen
Phellinus weirii	DF	Humboldt

AGENT	HOST	COUNTY
Phytophthora lateralis	POC	Humboldt
	POC	Del Norte
Ceratocystis wageneri	DF	Colusa
	DF	El Dorado
	DF	Del Norte (3)
	DF	Lake (3)
	DF	Marin
	DF	Mendocino (4)
	DF	Shasta (4)
	DF	Siskiyou
	DF	Sonoma
RUSTS:		
Cronartium ribicola	SP	Del Norte
	SP	Tulare (2)
Melampsora epitea	WW	Lassen
Peridermium harknesii	PP	Amador
	PP	Butte
	PP	Del Norte
	SHP	Del Norte
Peridermium stalactiforme	JP	Tulare
Pucciniastrum geoppertianum	GF	Mendocino
NEMATODES:		
Bursaphelenchus lignicolus	PP	Siskiyou

HOST ABBREVIATIONS

BL = Black locust
BO = Black oak
DF = Douglas-fir
DP = Digger pine
GF = Grand fir
GS = Giant sequoia
IC = Incense-cedar
JP = Jeffrey pine
LO = Live oak
MP = Bishop pine
MR = Monterey pine
POC = Port-Orford-cedar
PP = Ponderosa pine
SHP = Shore pine
SP = Sugar pine
RF = Red fir
RW = Redwood
WF = White fir
WW = Willow

PHYTOPHTHORA ROOT ROT OF PORT-ORFORD-CEDAR

Port-Orford-cedar, Chamaecyparis lawsoniana, is a major resource and an economically valuable timber species on the North Coast. The species has a limited distribution in California, occurring along the Pacific Coast from Del Norte County south to the Mad River drainage in Humboldt County, and extending eastward to near Indian Creek north of Happy Camp; it reappears further inland, predominantly on serpentine soils, on the Upper Trinity and Sacramento River systems in Siskiyou and Shasta counties. The species has been widely planted as an ornamental in the Pacific Coast states.

The estimated volume of Port-Orford-cedar in California is 240 million board feet. Most of the Port-Orford-cedar harvested is exported to Japan, where the wood has religious significance and is used in shrines and temples. Because of this religious significance, present stumpage prices in coastal California average $2500 to $3000/MBF.

The role of Port-Orford-cedar as a timber and ornamental tree is threatened by a root disease caused by the soil fungus Phytophthora lateralis.

DISEASE DISTRIBUTION. In the forest, P. lateralis infects only C. lawsoniana, where it is always fatal. The fungus will also infect other species of Chamaecyparis used as ornamentals.

Root rot of Port-Orford-cedar was first reported in the United States near Seattle in 1923 on nursery stock imported from France. In 1952 the disease was found at three locations in the cedar's native range in southwestern Oregon, and by 1954 was widely distributed throughout its native range in that State. The disease is widespread on ornamental cedars and on cedar planting stock in the states of Oregon and Washington, and in British Columbia. In the spring of 1980 the disease was reported for the first time in California at eight sites. Seven sites were within the Smith River drainage system in Del Norte County -- six on the Gasquet Ranger District, Six Rivers National Forest, and one at Jedediah Smith Redwoods State Park -- and the eighth was at a residence in the city of Eureka, Humboldt County.

THE FUNGUS. Phytophthora lateralis is a soil-invading, root-inhabiting fungus that infects succulent Port-Orford-cedar roots, kills the roots and girdles the tree at the root collar. The fungus forms sac-like reproductive structures (sporangia) which release free-swimming spores (zoospores) under conditions of high soil moisture and moderate soil temperatures (10-20° C). Zoospores can be spread locally in free soil water and over longer distances in moving surface water. When zoospores reach susceptible root tips, they germinate, penetrate the roots, and initiate infection.

Occasional infection of foliage can occur when low-hanging branches brush against infested soil during wet, windy weather.

The fungus forms thick-walled resting spores (chlamydospores) in soil organic matter and in host roots. Chlamydospores germinate in saturated, cool soil and then form sporangia which release zoospores to initiate new infections. If soils infested with chlamydospores are carried to uninfested areas, either by water or other agents, new infections can occur. The chlamydospores are resistant structures that can survive in the soil during dry, warm weather when conditions are unfavorable for growth of the fungus. Ideal conditions for growth of the fungus and spread of the disease are thus during the cool, wet late winter and early spring months.

SYMPTOMS OF INFECTION. After infecting young feeder roots, P. lateralis grows through the cambium and phloem to the root collar, where it girdles the tree. Infected rootlets first appear water-soaked and then darken. A characteristic sign of infection by Phytophthora is the presence of a sharp line of demarcation between the living white portion of the inner bark and the cinnamon to dark brown color of the dead tissue infected at the root collar. This discoloration may extend upward from the root crown to a distance approximating the diameter of the stem. As the fungus begins girdling the tree at the soil line, the foliage throughout the crown begins fading in color, turning dull green then various shades of yellow and bronze, and then brown. Cedar bark beetles (Phloeosinus spp.) often attack these dying trees.

Although the rate of symptom development following infection differs with the environment, death is certain once infection occurs. Infected trees are usually killed rapidly; smaller trees may die within a few months while larger trees may survive for a few years.

DISEASE SPREAD. Because the fungus is soil-borne, produces motile spores, and does not form spores above ground, the distribution of the disease is associated with water drainages, surface water movement, and with movement of infested soil. In Oregon, spread of the disease over long distances occurred through movement of infected planting stock, and movement of infested soil during road construction, forest road maintenance and use, and logging operations. Initiation of most new disease centers thus occurred along roads where logging and road building activities took place. Infested soil can occasionally be carried by cattle or wild game.

In California there is good evidence that the disease was spread by man, either by transporting of infected seedlings, by use of logging equipment contaminated with infested soil, or by dropping of infested soil from vehicles traveling forest roads. Once the fungus is moved to a new area and becomes established on cedar, local spread through water drainages becomes important in buildup of the disease and spread downslope. The fungus will not survive in the soil for more than a year or so in the absence of the host.

CONTROL. Once the fungus is established in the soil, it cannot be eliminated by presently known methods of direct control. No evidence of genetic resistance has been found, and there are no known conditions of soil or climate in areas suitable for Port-Orford-cedar that may limit the disease. Mortality in infested areas will continue, and the fungus will spread by root contact and by zoospores to adjacent cedars and then locally downslope in drainage water. Long distance spread to uninfested cedar areas by agents such as contaminated logging equipment is likely if such movement is not restricted.

Cedar can be salvaged as they die to recover volume, but the rate of additional mortality in surrounding cedars will not be reduced and the risk of local and/or long-distance spread to uncontaminated areas will not be decreased. Salvage with ground disturbance during the wet season will increase the risk of vehicles and equipment becoming contaminated with infested soil and subsequent spread of the disease to other areas. Salvage operations during the drier months and with minimal disturbance, such as the use of helicopter or cable logging, will minimize chances of disease spread.

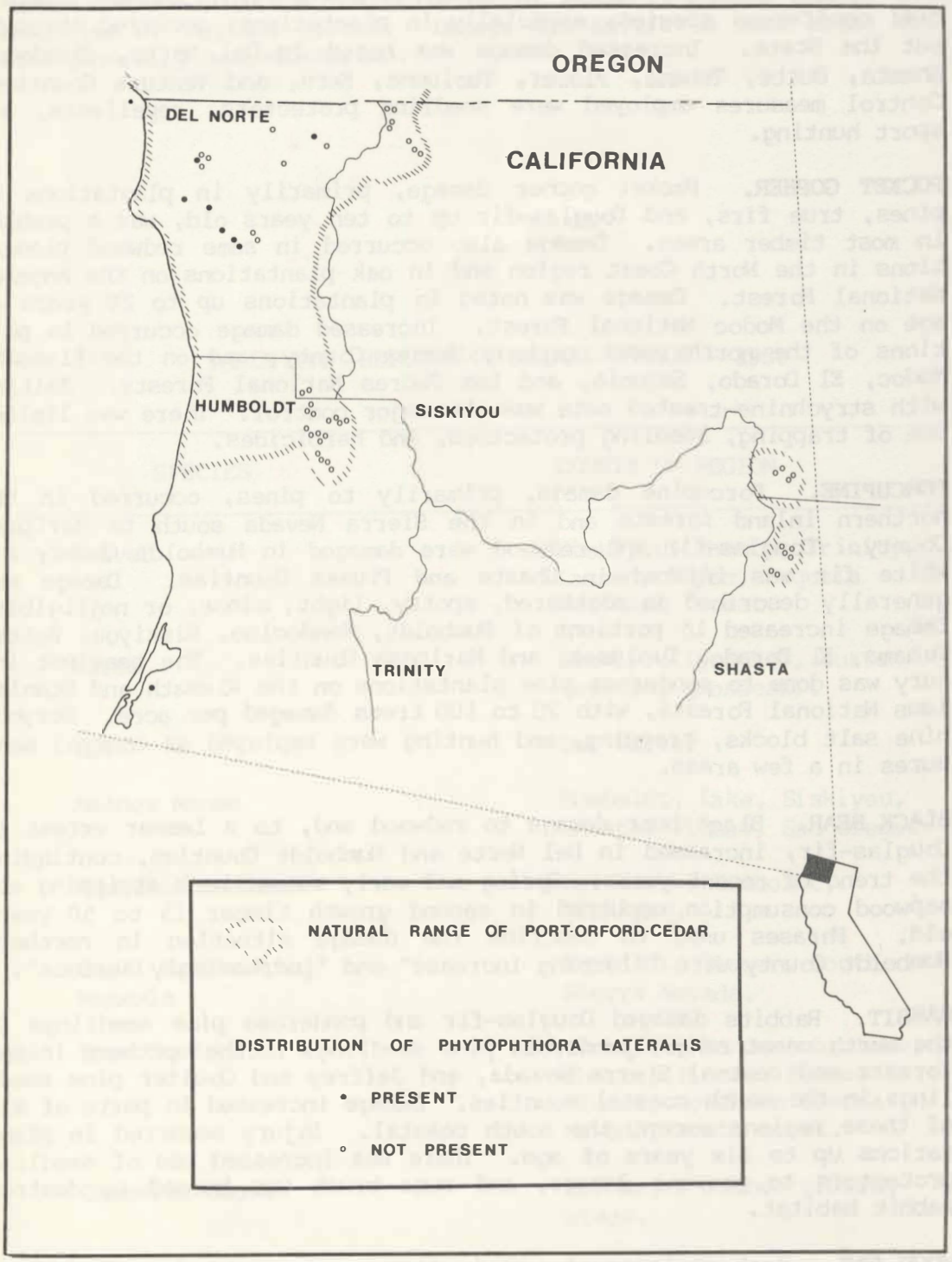
Cedar reproduction in infested areas will become infected and die before reaching merchantable size. The continued presence of susceptible trees will perpetuate the fungus. Removal of all cedars, including the understory, from the infested site, followed by site preparation and planting with a species other than Port-Orford-cedar, will help eliminate the fungus from the soil and reduce chances of spread.

Stands of Port-Orford-cedar that are presently uninfested by the fungus can be protected by taking steps to minimize the spread of the disease from infested areas. Since the disease is spread, or vectored, mainly by the activities of man, these activities can be regulated. It should be assumed that vehicles and logging equipment used recently in Port-Orford-cedar sites in Oregon or on the Gasquet Ranger District are carriers of the disease. Their entry into disease-free cedar areas will likely result in new infestations. Restricted entry of contaminated vehicles and equipment into noninfested areas would reduce risk of new infections.

The Powers Ranger District on the Siskiyou National Forest in Oregon has attempted to limit spread of the fungus to disease-free cedar production sites by contract restrictions and by development of an educational program. Clauses restricting operations in sale areas to periods of dry weather, not allowing tractor yarding, and requiring the gating of roads to limit travel during the wet season have been included in contracts. Informing the public and those working on the sites as to why restrictions are necessary has proved useful.

It may not be feasible, or necessary, to restrict entry into all disease-free Port-Orford-cedar sites in California. Rather, efforts could be directed first, to identifying sites of value, such as proposed Research Natural Areas, high-volume stands, and sites located upslope from roads and drainages, and then to developing regulations designed specifically for protecting these sites.

Continued surveillance for the disease by all land owners is needed. All new or suspected disease centers should be reported to the California Department of Forestry in Sacramento or to the Forest Pest Management Staff, U.S. Forest Service, in San Francisco. The standard Forest Pest Detection Report Form can be used if available.



Distribution of Phytophthora root rot of Port-Orford-cedar in northern California. The sites were sampled in the spring of 1980.

STATUS AND CONTROL OF ANIMAL PESTS

DEER. Deer browsing damage to seedlings and saplings of most commercial coniferous species, especially in plantations, occurred throughout the State. Increased damage was noted in Del Norte, Siskiyou, Shasta, Butte, Tehama, Placer, Tuolumne, Kern, and Ventura Counties. Control measures employed were seedling protectors, repellents, and sport hunting.

POCKET GOPHER. Pocket gopher damage, primarily in plantations of pines, true firs, and Douglas-fir up to ten years old, was a problem in most timber areas. Damage also occurred in some redwood plantations in the North Coast region and in oak plantations on the Angeles National Forest. Damage was noted in plantations up to 20 years of age on the Modoc National Forest. Increased damage occurred in portions of the north coast region, Shasta County, and on the Klamath, Modoc, El Dorado, Sequoia, and Los Padres National Forests. Baiting with strychnine-treated oats was the major control. There was limited use of trapping, seedling protectors, and herbicides.

PORCUPINE. Porcupine damage, primarily to pines, occurred in the northern inland forests and in the Sierra Nevada south to Mariposa County. Douglas-fir and redwood were damaged in Humboldt County and white fir was injured in Shasta and Plumas Counties. Damage was generally described as scattered, spotty, light, minor, or negligible. Damage increased in portions of Humboldt, Mendocino, Siskiyou, Butte, Tehama, El Dorado, Tuolumne, and Mariposa Counties. The heaviest injury was done to ponderosa pine plantations on the Klamath and Stanislaus National Forests, with 20 to 100 trees damaged per acre. Strychnine salt blocks, trapping, and hunting were employed as control measures in a few areas.

BLACK BEAR. Black bear damage to redwood and, to a lesser extent to Douglas-fir, increased in Del Norte and Humboldt Counties, continuing the trend of recent years. Spring and early summer bark stripping and sapwood consumption occurred in second growth timber 15 to 50 years old. Phrases used to describe the damage situation in northern Humboldt County were "alarming increase" and "increasingly serious".

RABBIT. Rabbits damaged Douglas-fir and ponderosa pine seedlings in the north coast range, ponderosa pine seedlings in the northern inland forests and central Sierra Nevada, and Jeffrey and Coulter pine seedlings in the south coastal counties. Damage increased in parts of all of these regions except the south coastal. Injury occurred in plantations up to six years of age. There was increased use of seedling protectors to prevent damage, and some brush was burned to destroy rabbit habitat.

WOOD RAT. Bark stripping by wood rats was reported from the three North Coast counties. Injury was inflicted primarily on 10- to 30-year-old Douglas-fir and redwood. The damage trend was variable, increasing in several areas and static or decreasing in others.

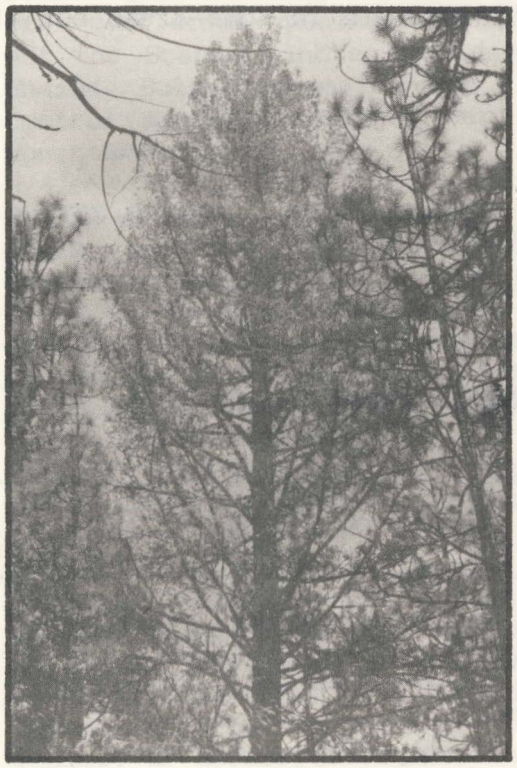
Damage to 60 to 70-year-old Jeffrey pine occurred on the Los Padres National Forest and was noted as increasing. Trapping and anticoagulant poisons were used for control in a few places.

OTHER ANIMALS. The animals listed in Table IV caused damage in the counties or regions listed. Damage was severe in some areas but it was generally not widespread.

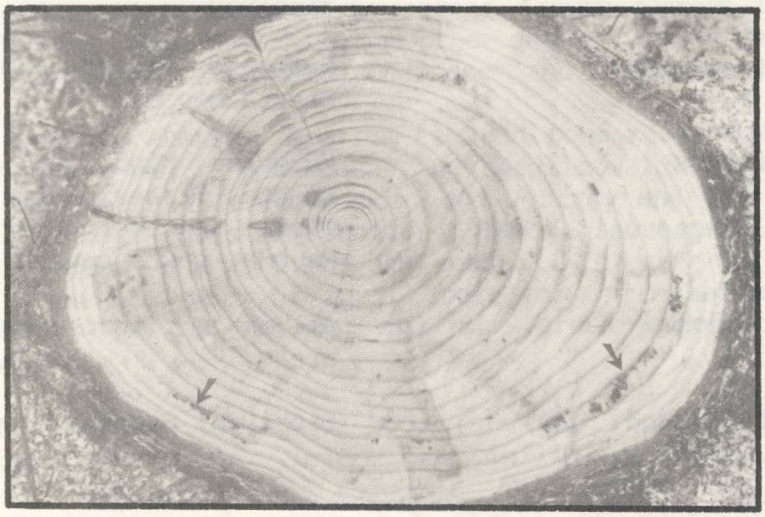
TABLE IV. REPORTS OF ANIMAL DAMAGE - 1980

SPECIES	COUNTY OR REGION
Beaver	Siskiyou, Shasta, Trinity, Lassen, Modoc, Sequoia National Forest.
Birds	Siskiyou (grouse), Butte (evening grosbeak).
Elk	Del Norte.
Meadow Mouse	Humboldt, Lake, Siskiyou, Shasta, Plumas, San Diego.
Mountain Beaver	Del Norte, Humboldt, Siskiyou.
Small Seed-eating Mammals	Humboldt, Placer, southern Sierra Nevada.
Tree Squirrels	Humboldt, Mendocino, Lake, Shasta, Placer, Butte, Plumas, southern Sierra Nevada, south coast.
Domestic Stock	All major timber growing areas.
California ground squirrel	Siskiyou, Shasta.

BLACK STAIN ROOT DISEASE



ABOVE LEFT: Declining crown of a Douglas-fir infected by Ceratocystis wageneri. Note the reduced terminal growth and loss of foliage. **RIGHT:** Black stain symptoms in the lower bole of an infected Douglas-fir. Heavy resin flow from affected tissues is common in trees growing near the coast. **BELOW:** In cross-section the black stain occurs in arcs that follow the annual rings. The stain may be in the surface wood or it may be buried several rings deep (note arrows in photo).



SURVEYS AND EVALUATIONS

BLACK STAIN ROOT DISEASE. An increased concern about black stain root disease, caused by Ceratocystis wageneri (Verticicladiella wageneri), has been expressed by resource managers, especially on Douglas-fir in the North Coast region. Because of this concern, a cooperative effort between the Forest Service, Forest Pest Management Staff, and the California Department of Forestry was initiated to solicit information from federal, state, and private resource managers on the location of black stain root disease areas in Douglas-fir on the North Coast. The objectives of the survey are to determine disease distribution and severity and site/stand characteristics where the disease is present.

PHYTOPHTHORA ROOT ROT OF PORT-ORFORD-CEDAR. The Port-Orford-cedar stands on federal, state, and private lands in northern California were surveyed in the spring of this year for the presence of Phytophthora root rot, caused by Phytophthora lateralis. Specific stand and individual tree data were taken at 50 sites. Other areas were inspected for dead or dying cedar on the ground and by use of optical bar photography. The disease was present at six sites on the Gasquet Ranger District, Six Rivers National Forest, Del Norte County, at Jedediah Smith Redwoods State Park, Del Norte County, and on ornamental cedars at one site in the city of Eureka, Humboldt County. The disease was not observed in other areas.

BIOLOGICAL EVALUATIONS. The evaluations shown in Table V on the following page were conducted in California during 1980 by the Forest Service, Forest Pest Management (FPM) Staff. These evaluations include brief descriptions of specific pest problems that were important on forest lands. They also contain current management alternatives, or control options, available to the land managers. Copies are available upon request from the Pacific Southwest Region of the Forest Service, Forest Pest Management, 630 Sansome Street, San Francisco, California 94111.

TABLE V. BIOLOGICAL EVALUATIONS - 1980

EVALUATION NUMBER	EVALUATION LOCATION	ACRES EVALUATED	HOST SPECIES	PEST OR PESTS INVOLVED
80-01	Cody and Bryan Creek Salvage Sales, Eldorado N. F.	80	RF	Ar,Ca,Sv
80-02	Heart Bar Campground, San Bernardino N.F.	40	BO,JP, WF	Ar,Ed,Fa
80-03	Pilgram Creek, Shasta-Trinity N.F.	420	PP	Fa,Cw
80-04	Figueroa Mountain, Los Padres N.F.	200	BDF,CP, LO,PP	Db,Dv,Fa, Pspp
80-05	Breezy Point Fuel-break, San Bernardino N.F.	160	PP	Dv,Fa,Oz, Pspp
80-06	Arrowhead R.D., San Bernardino N.F.	80	BO	Aa
80-07	Hanna Flat Campground, San Bernardino N.F.	15	BO,JP, WF	Am,Ar,Dj, Fa,Phr, Pspp,Sv
80-08	Middle Tompkins Area, Klamath N.F.	135	DF,IC PP	Fa,Ar
80-09	Board Ranch Progeny Test Plantation, Sierra N.F.	2	PP	Am,Ed
80-10	Three Sisters Bald Eagle Management Unit Klamath N.F.	2	PP	Db,Dm,Fa, Ips,Cw
80-11	LaPorte and Greenville R.D., Plumas N. F.	3,000	JP,WF	Ar,Dj,Et, Sv,Ta
80-12	Kings River R.D., Sierra N.F.	10	IC,SP, WF	Dm
80-13	Penoyar Property Goosenest R.D., Klamath N.F.	500	PP	Fa

EVALUATION NUMBER	EVALUATION LOCATION	ACRES EVALUATED	HOST SPECIES	PEST OR PESTS INVOLVED
80-14	Forks and Spring Cove Campgrounds, Sierra N.F.	50	PP	Fa
80-15	Chico Tree Improvement Center, Mendocino N.F.	2	DF	Ef,Hr
80-16	Sleighville House Area, Tahoe N.F.	40	PP	Db
80-17	Gasquet R.D., Six Rivers N.F.	26	DF,PP	Lp,Pha,Wr
80-18	Mad River R.D., Six Rivers N.F.	30	DF	Ac,Cf
80-19	Orleans R.D., Six Rivers N.F.	1	AL	Ab
80-20	Letts Timber Sale, Mendocino N.F.	3,350	BO,DF, KP,LO, PP,SP,WF	Ar,Fa,Cw
80-21	Barton Flats and San Gorgonio Campgrounds, San Bernardino N.F.	60	BO,JP, WF	Am,Ar,Ed, Fa,Dj
80-22	Board Ranch Progeny Test Plantation, Sierra N.F.	2	PP	Pg,Pptm
80-23	Laguna Mt. Visitor Center, Cleveland N.F.	50	BO,CP, JP	Ar,Fa,Mc
80-24	Upper Lake R.D., Mendocino N.F.	500	DF,PP, SP	Cp,Cr,Cw
80-25	McCloud Flat (1977) Progeny Test, Shasta-Trinity N.F.	14	PP	Asp,Ssp,Wd
80-26	Placerville Nursery, Eldorado N.F.	1	PP	Phy
80-27	Hermit Springs Progeny Test Plantation, Stanislaus N.F.	5	PP	Fa,Ro

EVALUATION NUMBER	EVALUATION LOCATION	ACRES EVALUATED	HOST SPECIES	PEST OR PESTS INVOLVED
80-28	Hat Creek and Grays Valley, Lassen N.F.	1,200	JP,PP, WF	Ar,Db,Dj, Dm,Ed,Fa, Fc
80-29	Wildwood Picnic Area, Tujunga R.D., Angeles N.F.	75	EL	Pl
80-30	Mono Hot Springs Campground, Pineridge R.D., Sierra N.F.	2	JP,LP, WF	Ar,Dj,Dm
80-31	Six Rivers, Klamath and Shasta-Trinity N.F.	45,000	POC	Phy
80-32	Lake Tahoe Basin Management Unit	2,500	IC,JP, LP,WF	Ar,Ed,Dj Dm,Sv
80-33	Cannell Meadow, Sequoia N.F.	12	CO,DP, JP,LO, WW	Ar,Phr
80-34	Crystal Lake Recreation Area, Angeles N.F.	200	JP,PP	Ar,Dj,Fa, Ips

HOST ABBREVIATONS

AL = Alder
BDF = Big Cone Douglas-fir
BO = Black oak
CO = Cottonwood
CP = Coulter pine
DF = Douglas-fir
DP = Digger pine
EL = Elm
IC = Incense cedar
JP = Jeffrey pine
KP = Knobcone pine
LO = Live oak
LP = Lodgepole pine
POC = Port-Orford-cedar
PP = Ponderosa pine
RF = Red fir
SP = Sugar pine
WF = White fir
WW = Willow

PEST ABBREVIATIONS

Aa = Fruit tree leafroller
Ab = Flatheaded wood borer
Ac = Cooley spruce gall aphid
Am = Armillariella root disease
Ar = Dwarf mistletoe
Asp = Web-spinning sawfly
Ca = Cytospora canker
Cf = Douglas-fir twig weevil
Cp = Pine resin midge
Cr = White pine blister
Cw = Black stain root disease
Db = Western pine beetle
Dj = Jeffrey pine beetle
Dm = Mountain pine beetle
Dv = Red turpentine beetle
Ed = Elytroderma disease
Ef = Excess fertilization
Et = Indian paint fungus
Fa = Annosus root disease

PEST ABBREVIATIONS

Fc = Fir canker	Pl = Elm Leaf beetle
Hr = Herbicide damage	Pptm = Ponderosa pine tip moth
Ips = Pine engravers	Pspp = Twig beetles
Lp = Lophodermium needle cast	Ro = Rodents
Mc = Calif. flatheaded borer	Ssp = Foliage feeding weevil
Oz = Ozone damage	Sv = Fir engraver
Pg = Pocket gopher	Ta = Fir roundheaded borer
Pha = Western gall rust	Wd = Winter desiccation
Phr = True mistletoe	Wr = Wood rat
Phy = Phytophthora root rot	

TRAINING. The Forest Service conducted a training session for private, State, and Federal forest managers on insect and disease identification and management near Mt. Shasta in June 1980.

RESOLUTIONS OF THE COUNCIL

The following Resolutions were adopted by the California Forest Pest Control Action Council at its annual meeting in Sacramento on October 30, 1980.

RESOLUTION NO. 1. To the California State Board of Forestry, the Western Forestry and Conservation Association, the Regional Forester, Pacific Southwest Region, and the Director, California Department of Forestry.

We, the California Forest Pest Control Action Council, do actively endorse, encourage, and support the principles and concepts of Integrated Forest Pest Management.

RESOLUTION NO. 2. To the California Forest Pest Control Action Council.

Be it resolved that the California Forest Pest Control Action Council amend the Charter to create a Standing Committee on Weeds. Charter will be changed where appropriate to encompass the new Standing Committee.

COUNCIL AND COMMITTEE OFFICERS, 1980-81

Council Chairman: Roy H. Richards (Paul Bunyan Lumber Company, Anderson)

Council Vice-Chairman: Donald L. Dahlsten (University of California, Berkeley)

Council Secretary: John M. Wenz (Forest Service, San Francisco)

Standing Committees:

Insect Committee:
Chairman: Bruce H. Roettgering (Forest Service, San Francisco)

Secretary: Bill Bedard (Pacific Southwest Forest and Range Experiment Station, Berkeley)

Disease Committee:
Chairman: John Pronos (Forest Service, San Francisco)

Secretary: John Kliejunas (Forest Service, San Francisco)

Animal Damage Committee:
Chairman: John Borrecco (Forest Service, San Francisco)

Secretary: Norm Holgersen (Fish and Wildlife Service, Sacramento)

Southern California Committee:
Chairman: Jim Bridges (Forest Service, San Bernardino)

Secretary: Chet Anthony (Forest Service, Fontana)

Editorial Committee:
Chairman: Richard Hunt (California Department of Forestry, Sacramento)

Executive Committee:

The Executive Committee is composed of the Council officers (3) and the Standing Committee Officers (9), as well as the following members-at-large:

Gil Murray (Collins Pine, Chester)
Lorne West (National Park Service, Yosemite)
Jerry Westfall (Forest Service, Grass Valley)